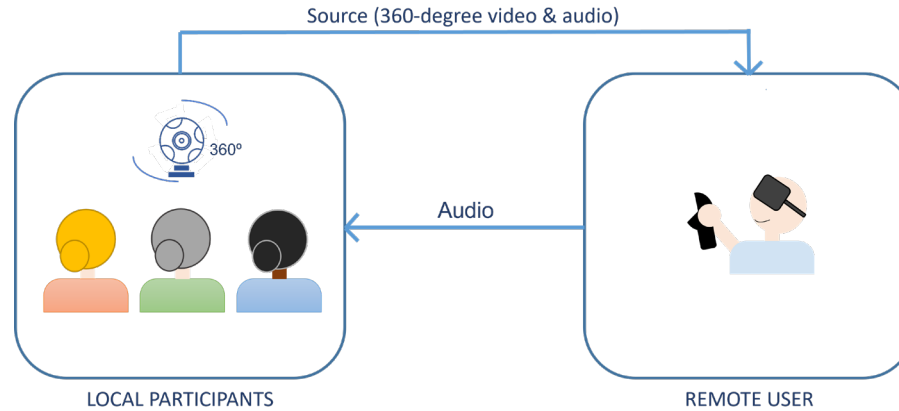


# Comparing SSDQE, SSCQE, and ACR in long duration 360-degree videos

Marta Orduna, Pablo Pérez, Jesús Gutiérrez, Narciso García

[marta.orduna@upm.es](mailto:marta.orduna@upm.es)

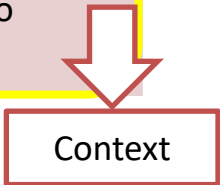


Addressing **technical** parameters (e.g., video quality) and **socioemotional** features (e.g., presence), while the experiment allows:

- » **interactivity** → interactive immersive communications
- » **reproducibility** → with other participants and other XR environments
- » **naturalness** → communication without following scripts

- Compare **three** methodologies of video quality assessment in **immersive communications environments** →
  - To validate video quality ratings obtained with **SSDQE with ACR**. We have conducted a previous experiment to assess video quality with SSDQE and socioemotional aspects
  - To find a methodology to assess video quality in **interactive** communications (SSDQE, SSCQE)

Methodology	ACR	SSCQE (Continuous)	SSDQE (Discrete)
Duration	Short	Long	Long
Disruption of the content	Yes	No	No
Continuity of the evaluation	No	Yes	No





Coffee shop



International office



Study in Spain

Name	Genre	Perspective-taking	Description
<b>Coffee shop</b>	Everyday conversation	Observer	<i>A coffee conversation between foreign and local students about cultural differences</i>
<b>International office</b>	Educational	Actor	<i>A presentation given by a professor to students about the foreign application process</i>
<b>Study in Spain</b>	Discussion	Actor	<i>A conversation about the differences between transport and rental prices in different countries</i>

QPs: 15, 22, 27, 32, 37, and 42



\*QPs randomized **once** for **each** content

- Sequences were encoded with HEVC switching to a different QP each 25 seconds to create **one PVS per content**
- All participants evaluated the same 3 contents (with the same randomization of the QPs)

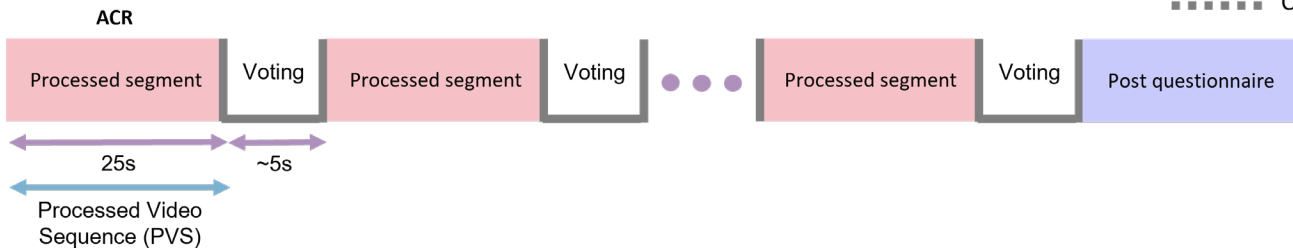


# Structure of the methodologies

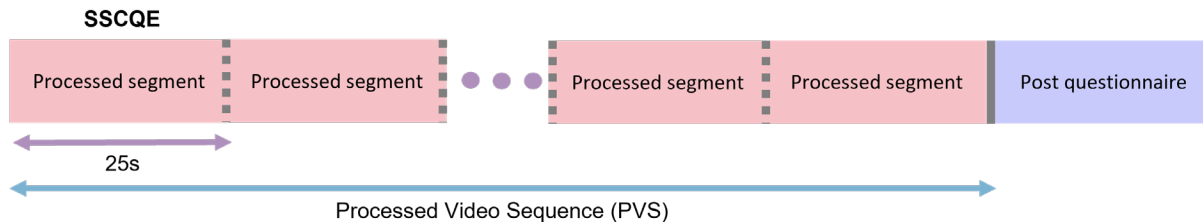


POLITÉCNICA

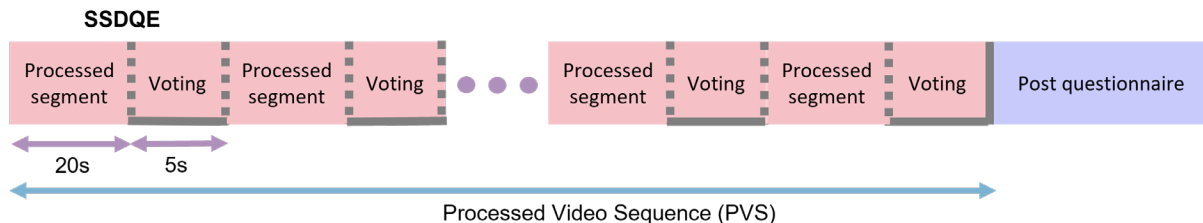
— Break in the content  
..... Continuity in the content



18 participants  
(10 female, 8 male)

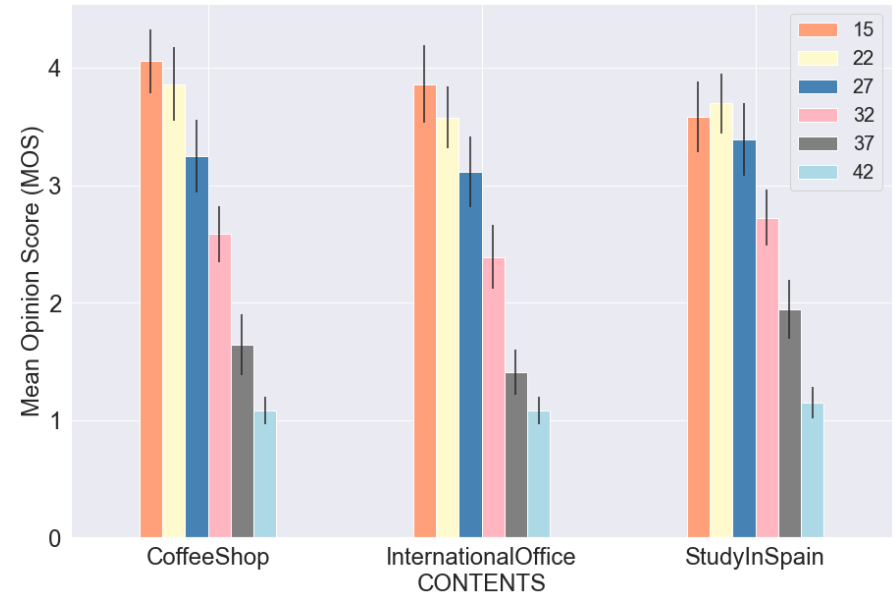
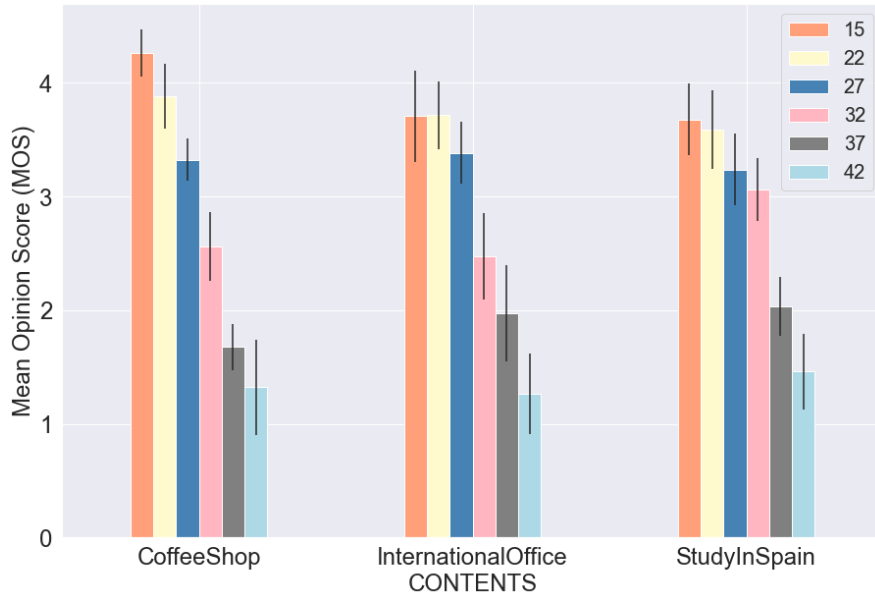


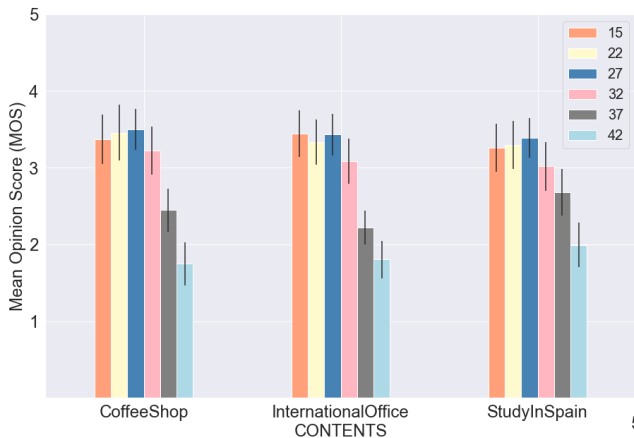
18 participants  
(9 female, 9 male)



18 participants  
(5 female, 13 male)

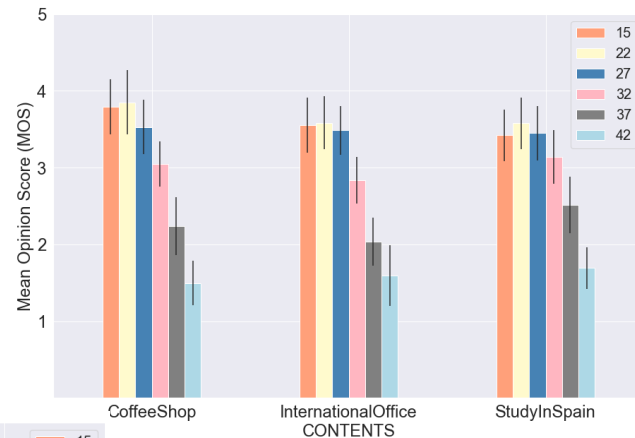
- The distribution of quality ratings is similar for both methodologies: ACR and SSCQE
- The statistical analysis shows that for both methodologies observers can distinguish all qualities except QP 15 and 22



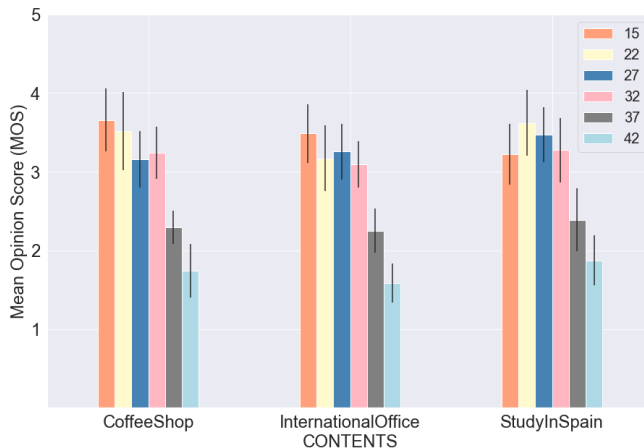


Window = {0s, 25s}

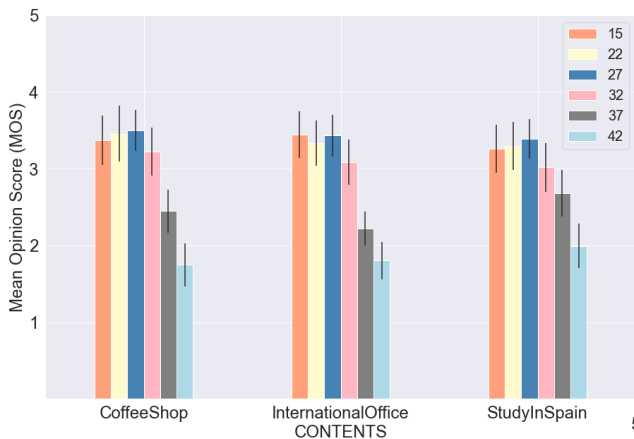
Window = {8s, 20s}



Window = {17s, 20s}

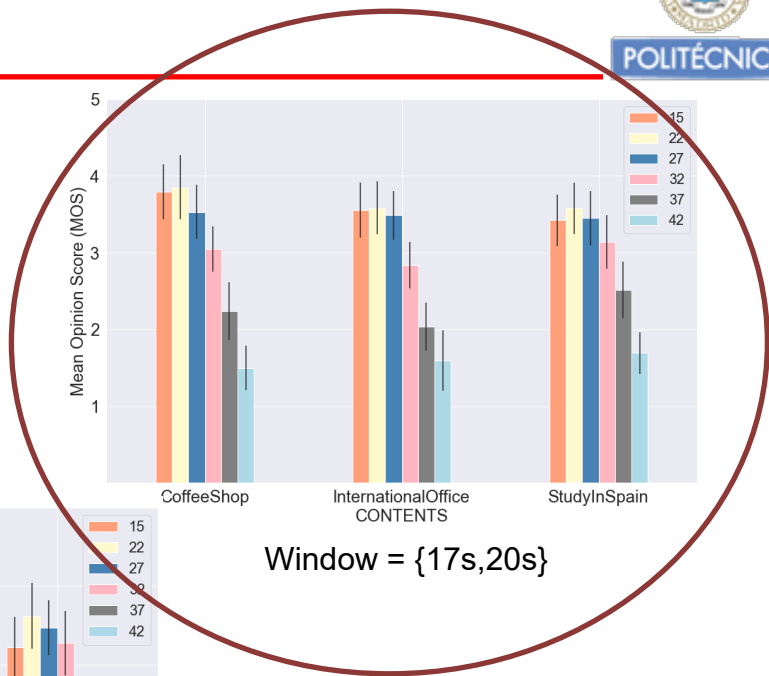




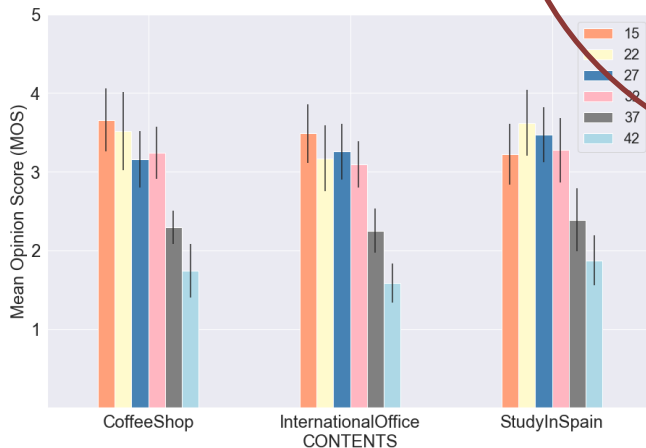


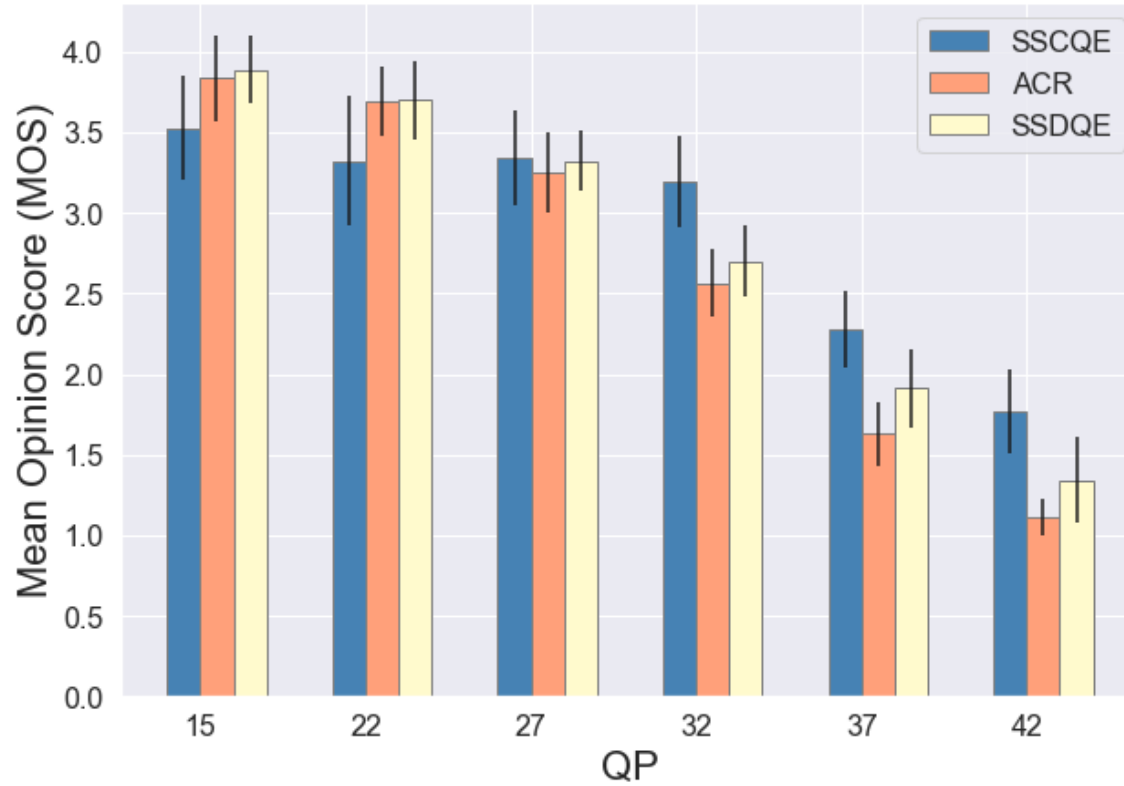
Window = {0s, 25s}

Window = {8s, 20s}



Window = {17s, 20s}



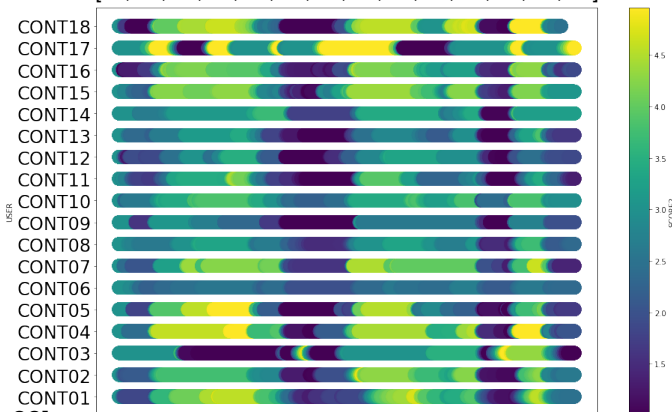




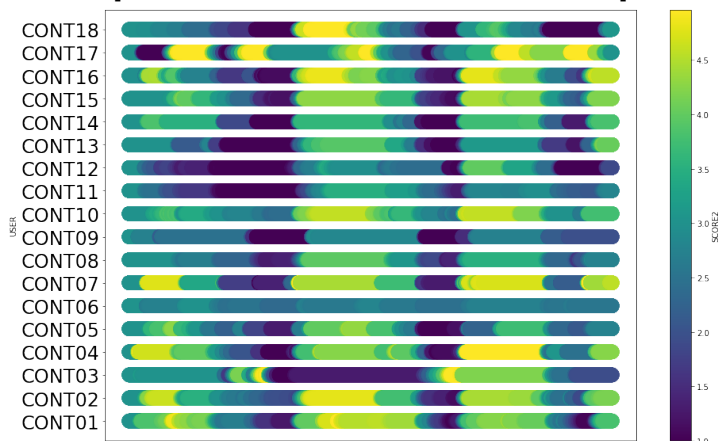
# SSCQE

Scoring behavior of the participants along the content

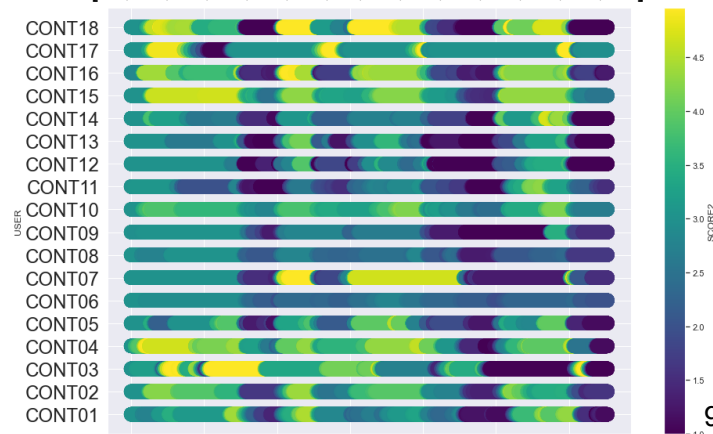
QPs =[37, 27, 22, 15, 32, 42, 37, 22, 27, 32, 15, 42, 22, 37]



QPs =[27,32,37, 42, 15, 22, 32, 42, 15, 27, 37, 22]



QPs =[27, 32, 15, 42, 22, 37,15, 27, 37, 42, 32, 22, 42, 37]



## SSDQE (discrete)

- We have validated its application for **long 360-degree video quality evaluation**
- We have checked its suitability for observer and actor perspectives in communications
- We have verified the compatibility of assessing socioemotional aspects while using SSDQE

## ... Interactive communications assessment

- SSCQE (continuous) and SSDQE (discrete) allow narrative and context while evaluating video quality
- But preliminary results of SSCQE present:
  - Results depend greatly on how the data is post-processed (which time window is selected)
  - Differences between observer and actor perspectives on the scoring behavior of the participants
  - Less range in MOS score distribution compared to SSDQE (apparently)

→ Future work: Can be SSCQE applied on interactive assessments?

## Objectives from IMG Work plan for Long Sequences. VQEG Berlin March 2019

### 1. Context

- Definition: a short (2-10 minutes) **full content** item.
  - This covers most relevant 360-VR content
- Useful for content immersive evaluation [Pinson *et al.* 2014]

### 2. In-sequence evaluation methodology

- Used to evaluate video quality in context (e.g., Single-Stimulus Continuous Quality Evaluation)
- Propose 0/1/2 methodologies (depending on test results)

### 3. Post-sequence evaluation

- Question to evaluate audiovisual quality of long sequences (e.g., for long-term effects)
- Guidelines (and questionnaire?) to evaluate presence

## Target: propose amendment to P.919 including long sequences

### 1. Context

- Long sequences are defined as full content items (with a coherent narrative).
- Typically, from 2 to 15 minutes (but they can be longer).
- Different HRCs (degradations) can be introduced along time.
- Long sequences are useful to evaluate degradations in context

### 2. In-sequence evaluation

- Propose Single-Stimulus **Discrete** Quality Evaluation (SSDQE)

### 3. Post-sequence evaluation

- We **don't** recommend using post-sequence ACR to evaluate global quality
  - Influenced by in-sequence evaluation, difficult interpretation.
- Simulator sickness can be evaluated (using existing P.919 methods)
- Other questionnaires can be used for Presence, Immersion, etc. They should be selected depending on the content and the research questions to evaluate (no particular one will be proposed as normative)

M. Orduna, P. Perez, J. Gutierrez and N. Garcia, "Methodology to Assess Quality, Presence, Empathy, Attitude, and Attention in 360-degree Videos for Immersive Communications," in *IEEE Transactions on Affective Computing*

Thank you!

Marta Orduna,  
[marta.orduna@upm.es](mailto:marta.orduna@upm.es)